distribution lines are connected to m sensors included in n sensor groups, each one connected to one of n return lines. The specification as well as the claims are clear as to how the m distribution lines, n sensors, and m return lines are configured in the m × n sensor array. In addition, two examples of n × m sensor arrays are provided, a 6 × 16 array and an 8 × 12 array.

The specification also explains how to select the coupling ratios of the couplers connecting the sensors and the fiber lines. The specification states that the output couplers have respective coupling ratios chosen to reduce differences in the respective returned optical signal power levels, preferably to within 7 dB of each other.

For example, the input coupling ratios for input optical signals coupled into the sensors of a group are higher for sensors groups farther removed from the lasers. Also, the coupling ratios for couplers within a given sensor group are selected to be progressively larger to compensate for the fact that the signals from the sensors pass through different combinations of couplers, causing each return signal to have a different overall transmission through the return fiber.

The goal is to select the coupling ratios of the input couplers and the output couplers to reduce differences in the level of optical signal delivered to each sensor and to reduce the differences in the returned optical signal power levels at the detectors. Preferably, the optical signals arriving at the detectors have respective powers within a 7 dB range. The specification on page 7, line 25, to page 8, line 15, explains how to calculate the returned power levels such that the coupling ratios can be appropriately selected. Accordingly, one skilled in the art is enabled as to how to practice the invention. Applicants respectfully request the Examiner to reconsider his rejection of Claims 1-3 and 9-12 under 35 U.S.C. 112, first paragraph.

Rejection of Claims 4-8, 9 and 10 under 35 U.S.C. 112, second paragraph

The Examiner rejects Claims 4-8, 9, and 10 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

The Examiner states that "said signal array" recited in Claim 4 appears to be vague and indefinite since it lacks proper antecedent basis. Accordingly, Applicants have deleted the phrase "said signal array" from Claim 4.

The Examiner further contends that the phrase "said ... coupling ratios *selected in accordance with respective locations* of said input couplers ... and *respective locations* of said output couplers" recited in Claim 4, the phrase "coupling ratios ... is *selected in accordance with a respective location* of ... output coupler" recited in Claim 9, and the phrase "the coupling ratios ... are *selected in accordance with respective locations* of said input couplers" recited in Claim 10 appear to be vague, confusing, and indefinite. The Examiner states that it is not clear whether these phrases mean that the coupling ratios have selected values at respective locations of the couplers or mean that the ratios are determined by certain selection rules "in accordance" to respective locations of the couplers.

Applicants respectfully disagree with the Examiner's contention. These phrases unambiguously mean that the selection of the coupling ratio depends on the location of the coupler, as described above. For example, the coupling ratios may vary within an individual sensor group, increasing for sensors in the group farther from the lasers and detectors. Similarly, the coupling ratios in sensor groups farther from the lasers and detectors may be larger than the coupling ratios in sensor groups closer to the lasers and detectors. To characterize this type of dependency the language "coupling ratios ... is *selected in accordance with a respective location* of ... output coupler" is appropriately employed. Applicants therefore respectfully request the Examiner to reconsider his rejection of Claims 4-8, 9, and 10 under 35 U.S.C. 112, second paragraph.

Rejection of Claims 1-12 under 35 U.S.C. 103(a)

The Examiner rejects Claims 1-12 under 35 U.S.C. 103(a) as being unpatentable over Frederick (U.S. Patent 5,696,857) in view of the patent issued to Hodgson, et al. (U.S. Patent 5,866,898). The Examiner states that Frederick teaches a fiber optic sensor array system comprising a plurality of sensor groups each having a plurality of sensors, a plurality of fiber distribution lines for providing signals to the sensors via input couplers, and a plurality of

output couplers each connected to a sensor for providing the signals from the sensors to a return fiber line.

The Examiner acknowledges that Frederick does not explicitly teach that each of the input couplers is connected to a respective one of the sensors and is connected to a different distribution line. The Examiner contends, however, that it would have been obvious to replace the input couplers to provide a single distribution fiber with an input coupler for each sensor respectively. The Examiner maintains that Hodgson shows each sensor has a single input coupler for providing a signal from a distribution fiber line to the sensor.

Applicants respectfully disagree with the Examiner's assertion that it would have been obvious to replace the input couplers to provide a single distribution fiber with an input coupler for each sensor. First, Frederick teaches away from providing m distribution fiber lines and input couplers connected to respective ones of said sensors, wherein each of said input couplers within any one of said sensor groups is connected to a different one of said m distribution fiber lines. The goal taught by Frederick is to use frequency division multiplexing (FDM) and wavelength division multiplexing (WDM) to interrogate more sensors with *fewer telemetry lines* (see column 4, lines 54-65 and column 5, lines 64-65) and to *minimize the array diameter* (column 5, lines 54-59). Accordingly, Frederick teaches away from increasing the number of lines and specifically teaches away from providing a single distribution fiber for each sensor in the groups of sensors. Second, the Examiner relies on Hodgson ('898) to teach that each sensor has a single input coupler for providing a signal from a distribution fiber line to the sensor. Hodgson, however, does not show m distribution fiber lines and input couplers connected to respective ones of said sensors, wherein each of said input couplers within any one of said sensor groups is connected to a different one of said m distribution fiber lines. Rather Hodgson shows a single distribution line for a plurality of sensors. Third, Figure 1 of Hodgson depicts a time division multiplexed (TDM) system not a wavelength division multiplexed (WDM) system (see, column 7, lines 42-44). TDM and WDM are fundamentally different processes.

The Examiner also acknowledges that the cited references do not explicitly teach the number of fiber lines, the specific coupling ratios recited for the input and output couplers, and the power range for the signals for return fiber lines. The Examiner maintains, however,

that these features are considered to be obvious variations since it is obvious that the wavelength division multiplexing (WDM) arrangements taught by the cited references have an inherent set of values for the WDM to be operable. The Examiner considers these values and features as merely obvious matters of design choice to one skilled in the art for obtaining particular multiplexing results.

Applicants respectfully disagree with the Examiner's assumption that these features are merely obvious design choices. Even if the wavelength division multiplexing (WDM) arrangements taught by the cited references have values for the WDM to be operable, it would not be obvious to use the values claimed by Applicants. The features claimed by Applicant are specifically selected to attain improved design and/or performance advantages over the prior art and are not merely obvious choices. Accordingly, the claimed features such as multiple fiber lines, the coupling ratios recited for the input and output couplers, and the power range for the signals for return fiber lines are thus not obvious from the cited prior art.

Applicants therefore respectfully request the Examiner to reconsider his rejection of Claims 1-12 under 35 U.S.C. 103(a).

Rejection of Claims 1-3, 4, 6, 9-10, and 11-12 under Obviousness-type Double Patenting

The Examiner rejects Claims 1-3, 4, 6, 9-10, and 11-12 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 2 of U.S. Patent No. 6,249,622 issued to Hodgson.

If the claims are otherwise found to be allowable, Applicants will provide a terminal disclaimer stating that the term of a patent issuing from this pending application is not to extend beyond the term of the parent patent U.S. No. 6,249,622 issued to Hodgson.

Summary

In view of the foregoing remarks, Applicants respectfully submit that the application is now in condition for allowance, and Applicants respectfully request the Examiner to allow the application and pass the application to the issue process.

Request for Telephone Interview

If there are any further impediments to the allowance of the claims of the present application, Applicants respectfully request the Examiner to call the undersigned attorney of record at 949-721-6361 or at the telephone number listed below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 12/04/01

By: _____

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VERSION OF CLAIM 4 SHOWING AMENDMENT

Claim 4 has been amended herein as follows, wherein deleted material is bracketed.

4. (Amended) A sensor array, comprising:

distribution fiber lines;

return fiber lines; and

sensor groups, each of said sensor groups comprising:

sensors; and

input couplers and output couplers, said input couplers and said output couplers being connected to respective ones of said sensors, each of said input couplers within any one of said sensor groups being connected to a different one of said distribution fiber lines;

wherein each of said return fiber lines is connected to all output couplers within respective ones of said sensor groups; and

wherein coupling ratios of said input couplers and said output couplers [in said signal array] are chosen to reduce differences in the returned optical signal power levels, said input couplers in a first sensor group having a first input coupling ratio and said input couplers in a second sensor group having a second input coupling ratio different from said first input coupling ratio, each output coupler connected to a respective return fiber line from a sensor group having a coupling ratio that differs from the coupling ratio of the other output couplers connected to the respective return fiber line, said input coupling ratios and said output coupling ratios selected in accordance with respective locations of said input couplers on said distribution fiber lines and respective locations of said output couplers on said return fiber lines.